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Comparative Responsiveness of Verbal and Numerical Rating Scales to Measure Pain Intensity in Patients With Chronic Pain

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Abstract: **Verbal rating scale (VRS) and numerical rating scale (NRS) are regularly used to assess and monitor pain in chronic pain patients. Although the NRS has been generally preferred, limited comparative responsiveness evidence was reported. This study compared the responsiveness of VRS and NRS measuring current pain and investigated the influence of different references (ie, worst, least, average, and current pain or their composite) on the NRSs' responsiveness. Two hundred fifty-four chronic pain patients attended a 10-day pain self-management program and were assessed with two 6-point VRSs (assessing current pain) and four 11-point NRSs (assessing worst, least, average, and current pain) at pre- and posttreatment. A patient-reported rating of pain improvement was used as the criterion for standardized response mean and receiver operating characteristic curve analyses. Results showed that the VRSs and NRSs exhibited small responsiveness in all patients, but the magnitude of responsiveness became moderate to large in patients with improved pain. However, in patients with pain improvements, the NRS current pain item and composite score (made up of the 4 pain items) were found to have significantly larger responsiveness and greater discriminatory ability to detect the presence of improvement than other current pain VRSs and the NRSs assessing worst, least, and average pain. Potential implications for clinical practice are discussed.**

Perspective: ***This study shows that the current pain and composite NRSs were more responsive than the current pain VRSs and the NRSs measuring other individual pain references in patients with improved pain, undertaking a short-term, self-management program. The results help inform the selection of pain intensity measures in studies using similar types of intervention.***

Key words: *Pain, numerical rating scale, verbal rating scale, responsiveness, self-report.*

Evaluating the benefit of treatments for people living with chronic pain requires outcome measures that are psychometrically sound in terms of reliability, validity, and responsiveness.[4] Pain intensity assessment is essential as evidenced by its routine consideration in clinical practice and treatment-outcome research.[12] Visual analog scale (VAS), verbal rating scale (VRS), and numerical rating scale (NRS) are regularly used to quantify pain intensity. Comparative psychometric properties of these pain intensity scales have been examined, but no single scale has consistently been shown to be superior to the others.[22,26]

A recent systematic review[22] of studies that have compared the psychometric properties of VAS, VRS, and NRS revealed that responsiveness evaluations were seldom undertaken. Responsiveness or sensitivity to change has been viewed as an important merit for pain intensity measures because it quantifies the propensity of measures to detect changes related to treatments.[31] The more responsive a measure is, the more confident clinicians and researchers can be that the measure will be sensitive to

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treatment effects for subsequent applications. Of the few studies that have compared responsiveness among the VAS, VRS, and NRS, the majority have been conducted in people with cancer[2,10,36] or acute postoperative pain.[18,30] However, responsiveness evidence established on these pain populations cannot be readily generalized to those with chronic nonmalignant pain because of differences in intensity, interpretation, and reporting of pain between these groups.[17]

Cumulative evidence comparing the responsiveness of the VAS, VRS, and NRS pain intensity measures in patients with chronic nonmalignant pain is needed. In previous studies that compared all 3 or either of the 2 types of pain intensity measures in this population, the NRS seemed to exhibit comparable or greater responsiveness than the VAS and/or VRS.[1,20,31] However, the results from these studies were limited by smaller sample sizes (ie, ≤79) and a lack of statistical comparison of the differences in responsiveness between the measures. Accordingly, there is inconclusive responsiveness evidence to guide clinicians' choice of pain intensity measures for daily practice evaluation. Likewise, in research settings, the limited responsiveness evidence may compromise the Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials (IMMPACT) recommendation to use the NRS as the primary instrument for measuring pain intensity in chronic pain clinical trials.[25] Notably, IMMPACT's endorsement of the NRS pain intensity measure was reportedly based on overall reliability and validity, without specific consideration of responsiveness evidence.

Irrespective of which type of measure is used, the most widely used reference when measuring pain intensity is one's current level of pain.[22,24] It has been argued that pain at a single time point (eg, current pain) may not be sufficiently representative of the pain experience because of its fluctuating and intermittent nature, particularly in chronic pain patients.[1,23] IMMPACT has recommended, when using the NRS, assessment of average pain in the past 24 hours or week (rather than current pain) as a core outcome measure and, depending on research design/need, has recommended that pain at its worst or least could also be considered.[12] Alternatively, a composite average measure (made up of the worst, least, average, and current pain) has been commonly used in clinical practice to avoid reliance on single ratings of certain pain. There are numerous studies investigating validity and reliability that supported the use of the composite measure of pain intensity[5,24] or IMMPACT's recommendations for the average/worst/least pain recall references[23,24,30]; however, once again, limited responsiveness evidence is available.

The purpose of this study was to 1) compare the responsiveness of NRS and VRS measures of current pain intensity in patients with chronic nonmalignant pain and 2) compare the responsiveness of the NRSs with 4 different pain references (ie, worst, least, average, and current pain) and their composite. In doing so, we sought to consider the suitability of IMMPACT's recommendations from a responsiveness perspective. We hypothesized that the NRS would be more responsive than the VRS in terms of assessing current pain and that, in the NRSs, the average pain item and/or the composite average score would exhibit higher responsiveness. The VAS was not included in this study because of its additional scoring burden, poorer completion rates, and lack of patient preference for the measure, compared to the NRS and VRS.[22,38]

Methods

Participants

Participants were patients attending a 10-day comprehensive pain management program[19] at the Royal Brisbane and Women's Hospital Multidisciplinary Pain Centre (MPC) in Brisbane, Australia, between 2005 and 2009. To be included in this program, the participants needed to 1) be at the age of 18 years or more, 2) have nonmalignant (or noncancer) pain, and 3) have experienced pain for more than 3 months. In this program, cognitive-behaviorally oriented group-based treatment was provided for a consecutive duration of 10 days (5 hours/day) by pain medicine physicians, nurses, psychologists, physiotherapists, and occupational therapists. Group sessions focused on education and physical activity to improve pain, emotional functioning, and physical functioning primarily via the application of conservative self-management principles. Multidisciplinary pain management programs are commonplace in clinical practice, and their efficacy and effectiveness for people with chronic nonmalignant pain is well established.[19] As part of the MPC's quality assurance procedure, patients completed a battery of self-report outcome measures on the first and last day of the program. The paper-and-pencil questionnaire battery consisted of various measures of pain intensity, pain quality, and physical function. Informed consent was also obtained from each patient. The use of these pre- and posttreatment responses in a deidentified form for this study was approved by the hospital's institutional review board.

Measures

Pain Intensity Measures

The VRS and NRS measures of pain intensity were included for responsiveness comparison. For the VRS, 2 frequently used 6-point measures of current pain were available for this study. The first was the Present Pain Index (PPI) derived from the McGill Pain Questionnaire,[32] which includes the following response options: 0 = no pain, 1 = mild, 2 = discomforting, 3 = distressing, 4 = horrible, and 5 = excruciating. The second was the pain intensity item from the Oswestry Disability Index (ODI) Version 2.0,[15] which consists of the options 0 = no pain, 1 = very mild, 2 = moderate, 3 = fairly severe, 4 = very severe, and 5 = the worst imaginable. In the PPI, participants are asked to choose the word that describes their pain "right now," and similarly the ODI pain intensity item is completed in reference to their pain "at the moment." The PPI has demonstrated satisfactory validity with respect to other pain intensity measures.[10,18,21] Specific psychometric evaluations of the ODI pain item are lacking; however, there is a wealth of psychometric evidence for the ODI as a whole,[7,15] which in turn lends support for use of the pain intensity item as a standalone measure.